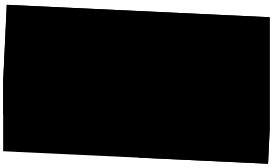

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Robyn Silbey, Math Coach and Author of
McGraw-Hill My Math® and Glencoe Math

So, what is the problem with problem solving?

We study mathematics because it helps us solve problems. Observation reveals that some students don't spend time identifying the p

Problem-solving strategies and applications relate to science, technology, and engineering as well as to everyday life. All mathematics content standards—from state-specific standards to the Common Core (http://www.corestandards.org/Math/)— focus on the practice and success of problem solving. They all acknowledge that how students learn mathematics affects how well they learn it.

The Common Core State Standards for Mathematical Practice (http://www.corestandards.org/Math/Practice/, pp. 6–8) describe in great detail how students can become mathematically proficient. Although, all mathematical practices provide students with a tool kit for problem eólevf1(c2s S1 - bet15)tp #: C eyr 15(inpT04P e5893an1)-8(w)23(el)15(l)]TJ582.20ts (a9(q)-8(8(o)8(thr

How can students build their problem-solving expertise and confidence?

One way is by using [redacted], a process in which teachers facilitate students' learning through the Standards for Mathematical Practice (http://www.corestandards.org/Math/Practice/, pp. 6–8) and the act of productive persistence.

Collaborative Problem Solving:

- Empowers students to reflect on their own thinking and learning.
- Enables teachers to analyze student thinking for instructional implications.
- Aligns with the Common Core Standards for Mathematical Practice and Productive Persistence.
- Can be used in K–12 classrooms.

Collaborative Problem Solving involves and engages every student in class. It also embraces the third Common Core Standard for Mathematical Practice:

A problem is presented to the class. To optimize discussion, the problem should be constructed so that students can use a variety of pathways to find the solution. Students think independently

(a) Students solve the problem independently. Using a rubric as a guide, students write a paragraph describing their solution strategies and justifying their answers.

(b) One or two volunteers, selected by the teacher for the clarity and quality of their responses, read their first drafts to the class.

(c) Using the rubric as a guide, students rate their classmates' responses on a scale of 0–4. (The sharing student(s) typically earn a score of about 3.)

(d) Through a class discussion, students collaborate to upgrade the responses to full-credit anchor papers. This third discussion about the original problem solidifies conceptual understanding for the majority of students.

Students may be asked:

- "Which strategy did you execute? Why?"
- "

All students reflect on the discussions and anchor papers and write a second draft. They may solve the problem in a different way and are welcome to change their solution from incorrect to correct. In their second drafts, students may also be asked to include responses to these questions:

- "If you changed your solution after the discussion surrounding the anchor paper, did you switch strategies to solve? Explain."
- "How can you tell if your answer makes sense?"
- "What ideas and concepts did you use to (a) solve the problem and (b) assess its reasonableness?"
- "What are some things you learned by solving this problem?"

Teacher Reflection:

After the students' work is done and their papers have been read, teachers should take the time to ask themselves:

- "Did my students understand the problem?"
- "What solution strategies were used? What does that reveal about my students' conceptual understanding?"
- "What terminology did students use? What terms did they neglect to use?"
- "Did the explanatory paragraph clearly articulate the process and rationale for the solution?"

The answers to these questions inform and drive instruction for students of all ability levels through curriculum standards and instructional pedagogy.

Students use Collaborative Problem Solving to live the Mathematical Practices in a risk-free environment, building independence, interdependence, self-reliance, and resourcefulness as they do so.

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